



### 2.3 Theory of the Firm (Market Structure)

#### **2.3.2 PERFECT COMPETITION (PC)**

##### **2.3.2.1 Characteristics of PC**

- Homogeneous product
- Freedom of entry & exit
- Infinite number of buyers & sellers
- Perfect knowledge of market conditions
- Zero transport cost

##### **2.3.2.2 Examples of PC**

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## 2.3.2 PERFECT COMPETITION (PC)

### 2.3.2.1 Characteristics of PC

- a) Infinite number of sellers and buyers
  - In a perfectly competitive market, there are a large number of sellers and buyers. Each of them sells or buys such a small quantity of the industry's output that individually, they are unable to influence the market price. As such, consumers and producers are said to be price-takers.
  - A seller cannot hope to increase price by reducing his supply since he is only one of the many sellers and market supply is hardly affected by individual actions.
  - Similarly, a buyer cannot hope to lower price by reducing his purchases since he is only one among many buyers.
- b) Homogeneous Product
  - All firms in the industry produce identical products and services and there is no way consumers can distinguish a product sold by a producer from the same product sold by another.
  - Advertising and other forms of non-price competition do not exist under perfect competition since the product is homogenous.
- c) Free Entry and Exit of Firms
  - No natural or artificial barriers to entry and exit.
  - Firms can enter or leave the industry depending on the size of profits or losses prevailing in the industry, hence no one firm can influence industry supply and the price of the product.
- d) Perfect Knowledge of market conditions amongst sellers and buyers
  - Each seller and buyer is fully aware of the price charged by others in the market. Hence no firm is able to charge a price higher or lower than its competitors.
  - Sellers are also aware of the technology available, input prices and the profit margins of other firms in the same industry.
- e) Perfect Mobility of all Factors of Production
  - In an extreme version of PC, factors of production are geographically and occupationally mobile, such that in the long run, new firms that enter the industry are not restricted by the lack of availability of any factor of production.
- f) No Transport Cost or Negligible Transport Cost
  - This ensures that the product will be sold at the same price in the market. If transport cost is involved, then the good will be sold at different prices in different

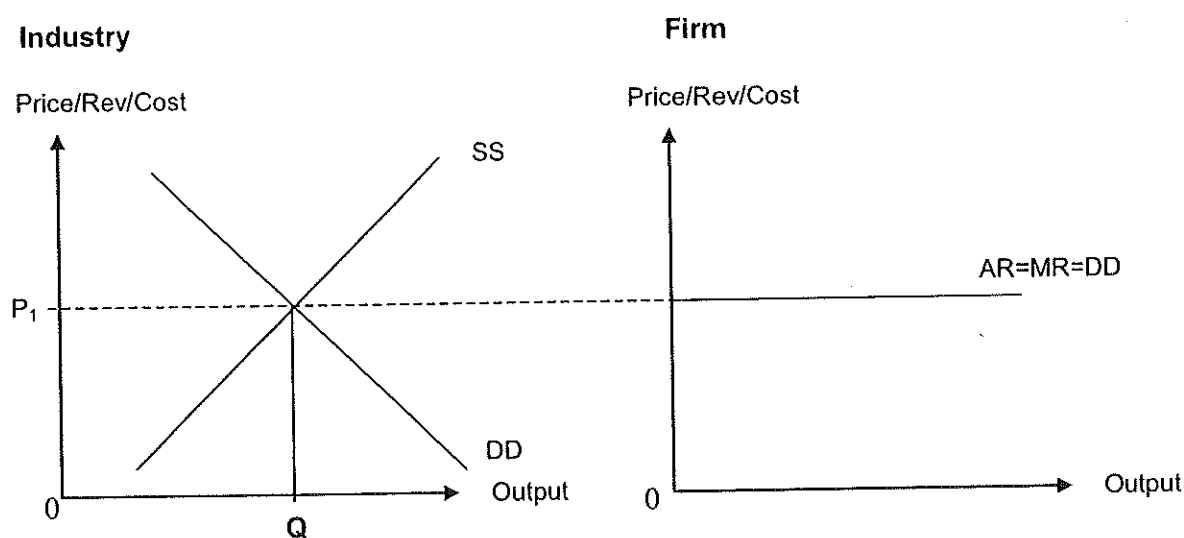
places in order to cover for these costs. Prices must be uniform for perfect competition to exist.

### 2.3.2.2 Examples of Perfect Competitive Industry

- Perfect Competition is a theoretical market structure but there are some industries that come very close to being perfectly competitive e.g. the market for some primary products e.g. sugar, rice, salt, and the market for stocks and shares.

### 2.3.2.3 Demand curves in PC

- A major distinction between firms operating in perfectly competitive markets and firms operating in any other type of market lies with the shape of the individual firm's demand curve. A firm faces a perfectly price-elastic demand curve (dd) but the market demand for the product (DD) remains a downward sloping one.
- Under the assumptions of the model, firms have no power whatsoever to affect the price of the product since they are price-takers (if they charge above the market price, consumers will go to another firm since products are homogeneous and there is perfect knowledge). The firm takes the price that is determined by the interaction of demand and supply in the entire market. Refer to  $P_1$  in Diagram 1.
- Each firm can sell as much as it wants at this price. The demand curve faced by an individual firm is perfectly price-elastic.



**Diagram 1:** The market demand curve and the demand curve faced by a single firm

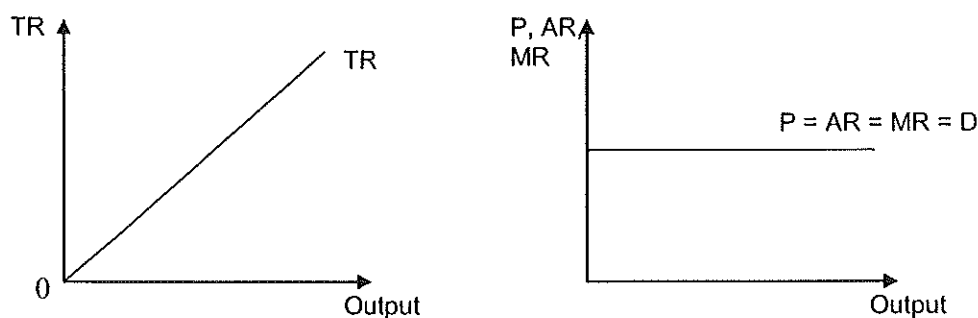
#### 2.3.2.4 Revenue Curves of the PC firm

There are 3 types of revenue to consider under this model:

- a) **Total Revenue**
- b) **Average Revenue**
- c) **Marginal Revenue**

##### a) **Total Revenue (TR)**

- Under perfect competition, the price remains the same regardless of the number of units the firm sells. As such, the TR increases proportionately with output (q) and it is depicted as an upward-sloping straight line from the origin as shown in Diagram 2.



**Diagram 2:** PC Firm's revenue curves

##### b) **Average Revenue (AR)**

- Under perfect competition, the AR is the firm's demand curve. The price remains the same regardless of the number of units sold. Hence the dd curve is perfectly elastic at the given market price.

##### c) **Marginal Revenue (MR)**

- Under PC, the price is constant for the firm. Hence the addition to the TR from the sale of an additional unit is the price of that unit.  $MR = AR = P$ . The MR for the PC firm coincides with the AR and the dd curve. Refer to Diagram 2.

#### 2.3.2.5 Short Run Equilibrium of the PC firm

##### **Behavioural Rules for Equilibrium (Profit maximizing / Loss minimizing)**

- A firm should produce up to the point where its profits are maximised.
- The profit-maximizing output can be determined by two approaches:
  - i) The TR – TC approach
  - ii) The  $MR = MC$  approach

- Graphically, profit maximising output level of output corresponds to the point where the difference between TR and TC is the greatest ( $Q_e$ ) or where MR is equal to MC.

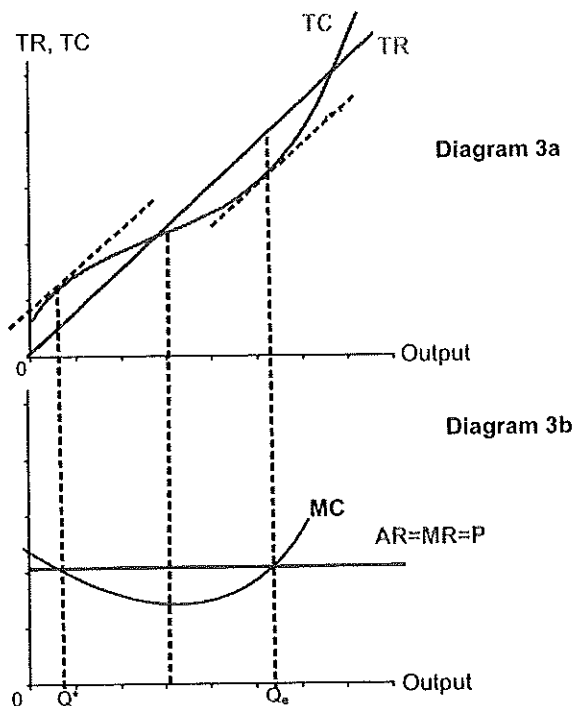


Diagram 3: the TR – TC and MR = MC approaches

i) The TR – TC Approach

- In diagram 3(a), the profits of the PC firm is maximized at the level output  $Q_e$ , where the vertical distance between total revenue and total cost is the greatest. (That is,  $TR - TC = \text{Maximum}$ )
- At output  $Q_e$ , MC (the slope of the tangent to total cost curve) is equal to MR (the slope of the total revenue curve)
  - At output below  $Q_e$ : the firm would enjoy greater profits by increasing production.
  - At output above  $Q_e$ : the firm would benefit from decreasing production.
  - Hence the firm will only be maximizing its profit at output level  $Q_e$ . This is the equilibrium output level.

ii) The MR = MC approach

- Profits will be maximized at the output level where  $MR = MC$  and MC curve cuts the MR curve from below as shown in diagram 3b.

- It will be profitable for the firm to expand output whenever MR is greater than MC because by producing one more unit, the firm adds more to TR than to TC. It will be able to increase his total profits or reduce his total losses. The firm should expand output until  $MR = MC$ .
- On the other hand, it will be profitable for the firm to reduce output if MR is less than MC because by producing the additional unit the firm adds more to total cost than it does to total revenue. The firm should reduce output until  $MR = MC$ .
  - Referring to diagram 3b, at output below  $Q_e$ : the addition to TR from increase production is greater than the addition to TC. Increase production would lead to higher profits.
  - Referring to diagram 3b at output above  $Q_e$ : the addition to TR from the production of an additional unit no longer covers the addition cost involved in producing that additional unit. The firm would benefit from reducing its output.
  - Hence the firm will only be maximizing its profit at output level  $Q_e$ . This is the equilibrium output level.

### 2.3.2.6 Shut down conditions of firms in the short run

In the short run, the perfectly competitive firm can be in equilibrium earning:

- Supernormal profit (positive economic profit)
  - Normal profit (zero economic profit)
  - Subnormal profit (incurring losses)
- a) **SR equilibrium earning Supernormal profit**
- Supernormal profit occurs when  $TR > TC$ . The firm is earning profits in excess of what is necessary to induce it to remain in the industry and to keep the plant and machinery in its present use. In the long run this supernormal profit will attract new firms into the industry.

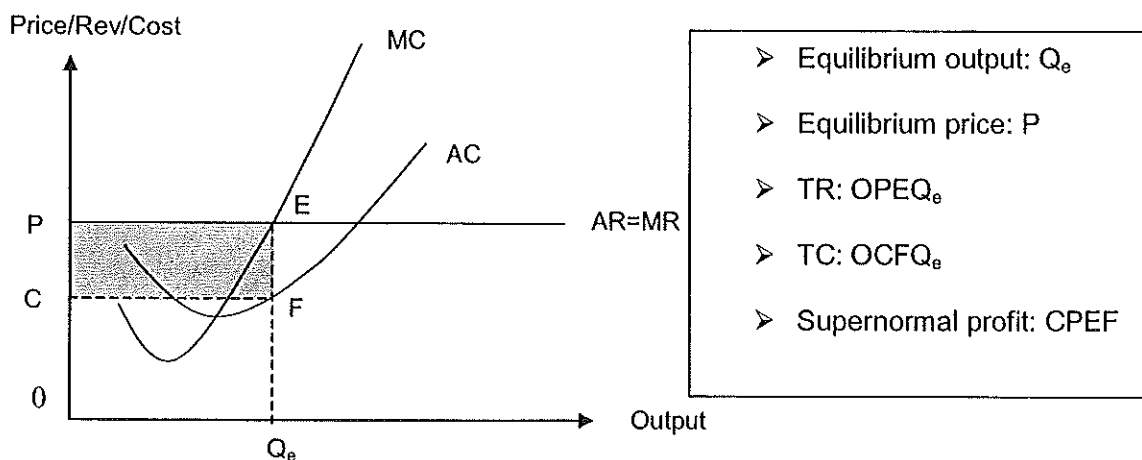


Diagram 4: Supernormal Profit

b) **SR equilibrium earning Normal profit**

- Normal profit refers to the situation where  $TR = TC$  (zero economic profit). The firm is earning just enough to cover all of its cost of production.

Price = AR = AC (AR is tangential to the lowest point of AC)

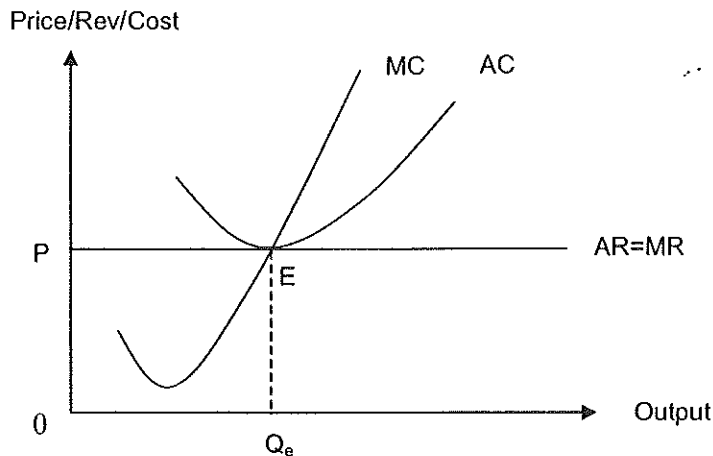


Diagram 5: Normal Profit

- The firm maximizes profit at output level  $Q_e$ , where  $MR = MC$  and MC curve cuts the MR curve from below.

Referring to diagram 5, at output level  $OQ_e$ :

$$TR = \text{Price} \times \text{Quantity} = P \times Q_e; \text{ area } OPEQ_e$$

$$TC = AC \times \text{Quantity} = EQ_e \times Q_e; \text{ area } OPEQ_e$$

- Hence the economic profit is zero as  $TR = TC$ .
- The firm is just earning enough to remain in the industry.

c) **SR equilibrium earning Subnormal profit (losses)**

- A firm makes subnormal profit when losses are incurred where the firm does not earn enough revenue to cover all of its cost of production. ( $TR < TC$ ).

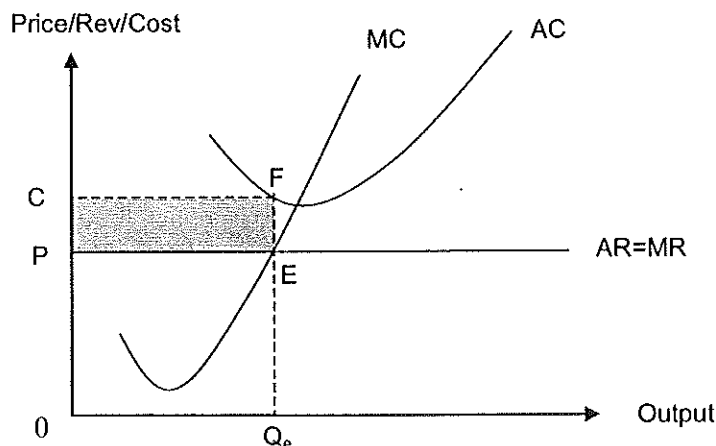
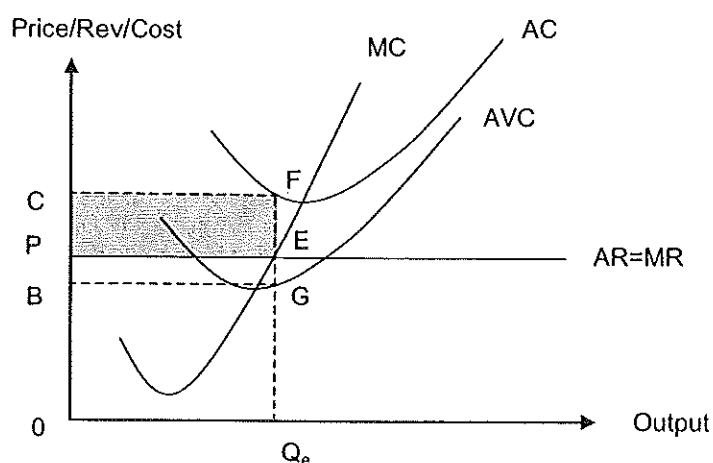


Diagram 6: Subnormal Profit

Referring to diagram 6,

- At equilibrium,  $TR < TC$ ,  $TR = OPEQ_e$ ,  $TC = OGFQ_e$
- $AR < AC$
- $OPEQ_e < OCFQ_e \Rightarrow$  Losses: PCFE
- In this case, the firm will attempt to minimize losses by either continuing production (at equilibrium level) or shutting down.
- When the firm is making subnormal profits in the short-run and has to consider whether to shut down or continue, the firm has to choose the optimal option that minimises its losses. The bottom line is whether its revenue covers its variable costs.

i) Loss making PC firm will continue production when  $TR > TVC$  or  $AR > AVC$



**Diagram 7:** Losses but revenue covers variable costs

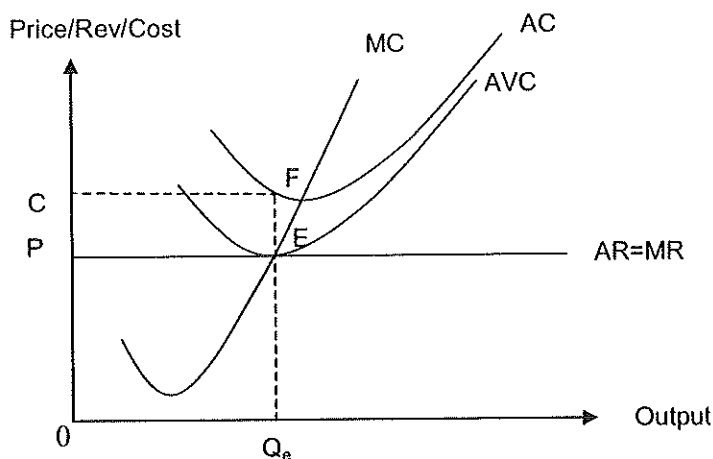
Referring to diagram 7,

- If the firm continues production:  $TR = OPEQ_e$ ,  $TC = OCFQ_e$ , Losses = PCFE
- If the firm stops production:  $TR = \text{Zero}$ ,  $TC = TFC = BCFG$ , Losses = BCFG

**Note:** The losses are smaller when the firm continues production. That is,  $PCFE < BCFG$ .



ii) Loss making PC firm with  $TR = TVC$  or  $AR = AVC$

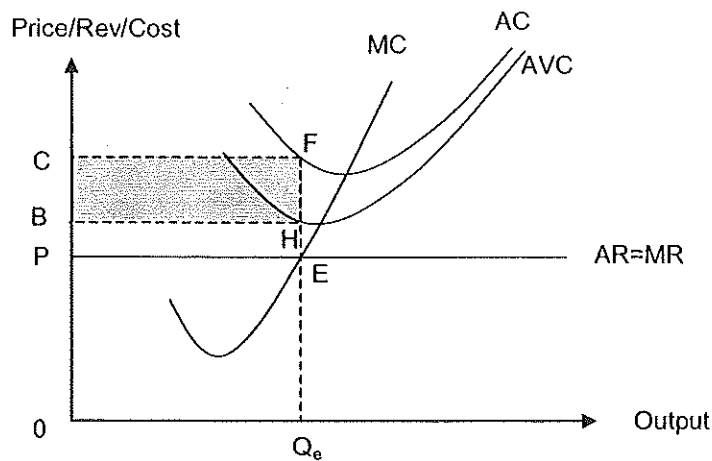


**Diagram 8:** Losses & revenue equals variable costs

Referring to diagram 8,

- If the firm continues production:  $TR = OPEQ_e$ ,  $TC = OCFQ_e$ , Losses = PCFE
- If the firm stops production:  $TR = \text{Zero}$ ,  $TC = TFC = PCFE$ , Losses = PCFE
- The firm is indifferent as to whether it should or should not continue production with regards to losses. However, it would continue production if;
  - it expects business to pick up later (optimism).
  - it would lose its labour force and would need to retrain again later if it shuts down temporarily.
  - it has built up its goodwill with its pool of customers and would not want to lose them.
  - it keeps the machines in good running order.

- iii) Loss making PC firm will shut down in the short run if  $TR < TVC$  or  $AR < AVC$



**Diagram 9:** Losses & revenue cannot cover variable costs

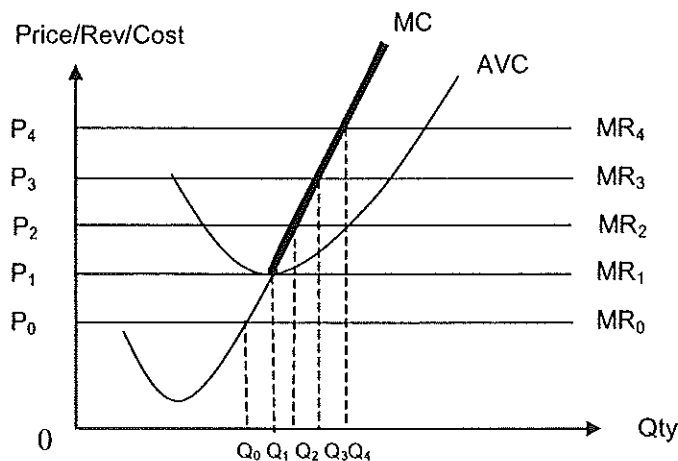
Referring to diagram 9,

- If the firm continues production:  $TR = OPEQ_e$ ,  $TC = OCFQ_e$ , Losses =  $PCFE$
- If the firm stops production:  $TR = \text{Zero}$ ,  $TC = TFC = BCFH$ , Losses =  $BCFH$

**Note:** The losses are smaller when the firm stops production.  $BCFH < PCFE$

### 2.3.2.7 Short Run Supply Curve of the PC firm

- To derive the short run supply curve of a PC firm, we need to examine how the output of the firm respond to changes in the market price of the good.



**Diagram 10:** Firm's SR Supply Curve

- Remember that the equilibrium profit-maximizing output always occurs at  $MC = MR$  and MC curve cuts MR curve from below.
- Note: The firm will only produce when the price ( $AR = MR$ ) is at least equal to AVC (from  $P_1$  upwards).

Referring to diagram 10,

- At price  $P_0$ , the firm's AR is less than AVC, indicating that the firm is making losses. Therefore, the firm will not produce at price  $P_0$ .
- At price  $P_1$ , the firm's AR = AVC, though the firm is indifferent between producing and shutting down, it will continue to produce as it would want to maintain its good reputation with customers as well as keep the machines in good working conditions.
- Above price  $P_1$ , the firm's AR > AVC, therefore the firm will continue production.
- Hence the SR supply curve of the PC firm is the portion of the MC curve above the AVC (as represented by the thick line in diagram 10).

### 2.3.2.8 Short Run Supply Curve of the PC industry

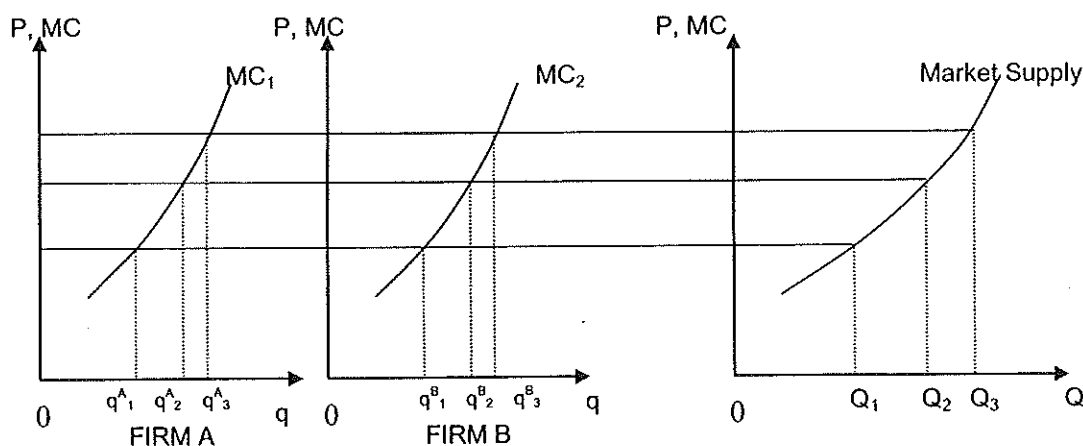
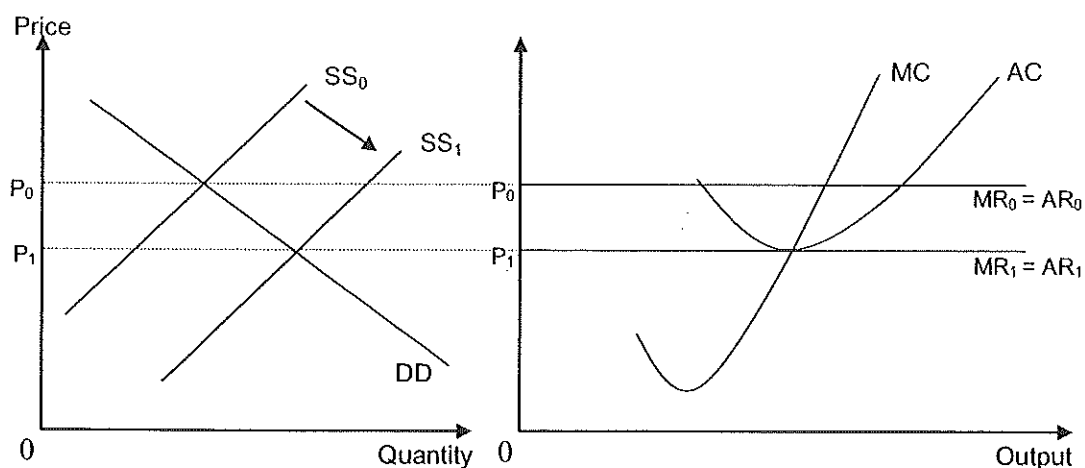


Diagram 11: SR Supply Curve of Industry

- The SRSS curve of the PC industry can be obtained by adding the output of each PC firm at every price level (horizontal summation of all the firms' MC above AVC). This is illustrated in diagram 11.

### 2.3.2.9 Long Run Equilibrium of the PC firm

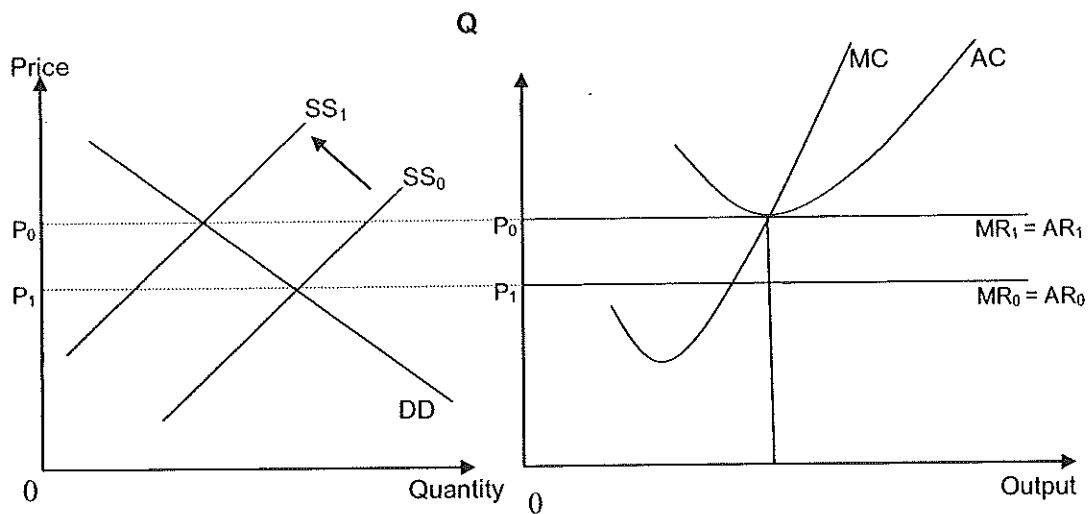
- In the long run, a firm can adjust its plant size and firms can enter or leave the industry as they wish.
  - The condition of free entry and exit in the competitive industry results in firms making only normal profits in the LR.
- a) **If the existing firms are earning supernormal profits**
- This would attract potential firms to enter the industry:



**Diagram 12a: Industry & Diagram 12b: Firm (Complete the diagram by showing Q)**

- Referring to diagram 12a, at price  $P_0$ , supernormal profit is made by the firm. New firms will be attracted to enter the industry.
- The industry expands and the industry supply curve shifts to the right in diagram 12a,
- Assuming unchanged demand, the market price will fall.
- The level of profits will also fall. Hence the supernormal profits are competed away.
- Firms continue to enter the industry until equilibrium price has fallen to such an extent that no more supernormal profits can be earned.
- Assumption for the above analysis: Constant cost condition  $\Rightarrow$  Prices of all factors of production remain unchanged, regardless of level of output produced by the industry. This means that the ATC and MC curves of all firms in the industry remain at the same level as shown in the diagrams above.

b) If existing firms are incurring losses



**Diagram 13a: Industry & Diagram 13b: Firm (Complete the diagram)**

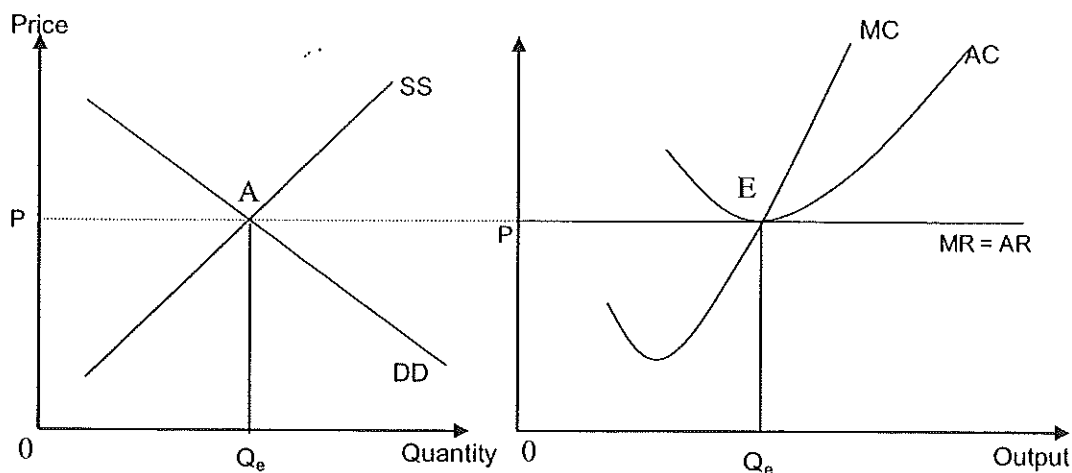
- Referring to diagram 12a, at price  $P_0$ , losses are suffered.
- Some firms will leave the industry.
- The industry contracts and the industry supply curve shifts to the left as shown in diagram 13a.
- With unchanged demand, the market price will begin to rise.
- A smaller number of firms will now be in the industry, each earning only normal profits. At this stage no firms will leave the industry.
- The firms are now in long run equilibrium, where  $MR = MC = AR = AC$

**Note:**

- It is also under the Constant Cost Condition.
- It is producing at the lowest point of the LRAC curve. This means that the firm is producing at the optimum plant size.

### 2.3.2.10 Long Run Equilibrium in a PC industry

- The perfectly competitive industry is in equilibrium in the long run when there is no more new firms entering the industry or existing firms leaving the industry. All firms in the industry are making only normal profits and producing at the minimum point of LRAC.



**Diagram 14a:** LR Equilibrium of a PC Industry & **Diagram 14b:** LR equilibrium of a PC Firm

- Referring to diagram 14a and 14b, the long run equilibrium positions of the industry and firm are at points A and E respectively. At point E, the PC firm is earning normal profit. There is no incentive for firms to enter or leave the industry. Each firm is operating at the minimum point of its LRAC.
- Productive efficiency occurs at the level of output where the LRAC is minimum.
- Allocative efficiency occurs at the level of output where  $P = MC$ .
- At point E, both types of efficiencies are achieved.

### 2.3.2.11 Evaluation of PC

#### a) Advantages

##### i) Productive Efficiency: minimum AC

- The firm is using the minimum amount of resources to produce the given output with the given technology.
- Plant size is optimized. It is operating at full capacity, i.e. lowest point of AC.
- For the industry to produce at the minimum cost, all firms must produce at the minimum LRAC and have the same MC. If firms have differing MC, output can then be reallocated to firms with lower MC to reduce total cost.

- Firms compete in terms of cost of production. Cost inefficient firms will not be able to stay in business in the long run.
- All perfectly competitive firms produce a homogeneous product. There is no need for persuasive advertisement, which wastes scarce resources.
- Cost efficiency is desirable from society's point of view because resources are scarce relative to unlimited human wants. Resources should therefore not be inefficiently used.
- When the firm is at long run equilibrium,  $P = \min AC$ . This is of benefit to the consumers as they are paying the lowest possible price for the good.

ii) **Allocative efficiency (price = marginal cost, assuming no external costs or benefits exist)**

- The price shows how much the consumer values an additional unit of the good. The higher the marginal utility (marginal utility is the satisfaction gained from consuming an additional unit of the good), the higher the consumer values that additional unit of the good. He will be prepared to pay a higher price for that unit of the good.
- The MC is the additional resource cost incurred in producing one more unit of the good. It also represents opportunity cost.
- When  $P = MC$ , the consumer values the last unit of the good as much as it costs to produce that last unit. So, there is no over or under production of the good to meet consumers needs. Resources are said to be efficiently allocated. The long run equilibrium output of QL is the right quantity of good to-produce for the consumers. Refer to diagram 14b.
- $P > MC$  (below  $Q^*$  output)  $\Rightarrow$  the consumer values an additional unit of the good produced more than it costs to produce that additional unit of the good. The consumer values additional units of the good more highly than the alternative goods that these additional resources could produce (opportunity cost), suggesting that the firm is not producing enough of the good There is under-allocation of resources to the production of the good. The firm should therefore expand output to  $Q^*$ .
- $P < MC$  (above  $Q^*$  output)  $\Rightarrow$  the consumer values an additional unit of the good less than it costs to produce that additional unit. The consumer values additional units of the good less than the alternative goods that these additional resources could produce. The firm is producing too much of the good. There is over-allocation of resources to the production of the good. The firm should contract output to  $Q^*$ .

iii) **Consumer sovereignty and profit motive**

- In a perfectly competitive industry, there is consumer sovereignty. The producers produce according to the wishes of the consumers. Consumers express their wants through the demand for the good. Assume initially, the firms are at the long run

equilibrium and making normal profits. If the consumers have an increased preference for the good, the demand for the good rises. Supernormal profits are made. New firms will enter the industry and existing firms expand. More resources are now allocated to produce the good.

- Under perfect competition, resources are said to be efficiently allocated as they are used to produce goods wanted by consumers. With scarcity of resources and unlimited human wants, it will be a waste of resources if they are used to produce goods not wanted by consumers.

**b) Disadvantages**

**i) Unable to reap economies of scale**

- When substantial internal economies of scale exist, a perfectly competitive firm that produces a small output will not be able to enjoy the cost savings associated with a large output. So, a perfectly competitive industry is unsuitable for the production of cars, aircraft, aluminium, etc. where large economies of scale exist.

**ii) Lacks incentive and funds for Research & Development**

- If a perfectly competitive firm undertakes Research & Development and is successful, it will earn supernormal profit only in the short run. In the long run, perfect knowledge and the entry of firms due to free entry will compete away the supernormal profit. Because of the short-term nature of supernormal profit, the firm lacks incentive for R & D. This can have an adverse effect on the long-term economic growth of the country since technical progress is a means to economic growth.

**iii) Homogeneous products**

- A perfectly competitive industry cannot cater to the varying preferences of consumers in terms of size, quality, design, colour and style.

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